REMARKS/ARGUMENTS

Introduction

In the present amendment, dependent claim 6 has been amended. Claims 1 to 20 are presently pending in this application with claims 19 and 20 withdrawn from consideration. Applicants respectfully request reconsideration of the application in view of the foregoing amendments and the following arguments.

Amendments to the Claims

Claim 6 has been amended by deleting the phrase "to about percent" therefrom. Applicants submit that this amendment does not add any new matter.

Claim Objections

Claim 6 has been corrected by deleting the phrase "to about percent", thereby traversing the objection.

Claim Rejections - 35 USC 103

Claims 1-18 stand rejected under 35 USC 103(a) as being unpatentable over the Crowther et al. publication. Applicants respectfully submit that the rejection is improper because the Examiner has failed to establish a prima facie case of obviousness with respect to these claims.

Crowther et al. discloses a laboratory-scale simulation of a conventional thin slab direct rolling (TSDR) process for producing microalloyed steels. As disclosed at p. 637 of Crowther et al., this process includes the following steps:

1. The steels were melted in air, and cast into moulds to produce 50 mm thick ingots (p. 637, col. 1, 5th to 3rd lines from bottom);

2. The ingots were equalized in a furnace set at temperatures of 1050°C, 1100°C or 1200°C for 30-60 min prior to rolling (p. 637, from 2nd last line of col. 1 to 1st line of col. 2);

3. After equalizing the ingots were rolled on a laboratory reversing mill into 7 mm strips by 5 passes (col. 2, lines 1-3);

4. After the 4th pass, the strips were held until a temperature of approximately 870°C was reached, and the holding times were approximately 25-40 s (col. 2, lines 4-7);

5. After rolling, the strip was cooled under water sprays to simulate run-out table cooling (col. 2, lines 10-11); and

6. Following cooling, the strips were immediately put into a furnace set at 600°C and slow cooled ... to simulate coiling (col. 2, lines 12-15).

The above laboratory process is intended to simulate a TSDR process in which a continuously cast slab is charged, without cooling to ambient temperature, into an equalization furnace and is then reduced in thickness in a multi-pass rolling mill. The strips were held for approximately 25-40 seconds between the 4th and 5th rolling passes. The Crowther et al. process may produce a steel product with high strength, for example in the range from 460-560 MPa (Abstract).

Turning now to the present invention, claim 1 describes a process for producing a flat rolled steel product comprised of high strength, low alloy steel containing a hardness-promoting microalloy, the process including steps (a) to (h).

As stated in paragraph [00013] of the application as originally filed, the process according to the present invention preferably utilizes many of the same process steps and apparatus as modern thin slab and medium slab processes for producing flat rolled steel products. Accordingly, there are similarities between the process of claim 1 and that disclosed by the Crowther et al. reference. For example, Crowther et al. discloses the steps of casting ingots, hot-charging the ingots into a furnace, reducing the thickness of the ingots in a rolling apparatus, and cooling the product. These steps are analogous to, but not necessarily identical to, steps (a), (b), (g) and (h) of claim 1.

There are also a number of significant differences between the Crowther et al. process and the process of claim 1. One of these differences, specifically mentioned by the Examiner at para. 6 of the Office Action, resides in the fact that Crowther et al. discloses only one rolling apparatus (a laboratory reversing mill), whereas claim 1 includes two reduction steps using a first rolling apparatus and a second rolling apparatus. The Examiner states, however, that the use of two rolling apparatus instead of one reverse rolling mill "would not be a patentable difference since it would be a matter of choice well within the skill of the artisan to select type of rolling apparatus to apply to process which is productive of no new and unexpected results".

Applicants respectfully disagree with the Examiner and submit that the differences between the Crowther et al. process and that recited by claim 1 provide results which are not foreseen by Crowther et al. or any of the prior art of record.

Firstly, Applicants would like to mention that the process of claim 1 is designed to provide a flat rolled steel product which not only possesses high strength, but which also possesses high formability. The combination of these two properties is important in the production of steel products suitable for use in situations where light weight, formability, and strength are critical, for example in

the automotive industry. The importance of combined high strength and formability are discussed in the present application and also in U.S. Patent No. 4,415,376 (Bramfitt et al.), one of the references cited by the Examiner.

As mentioned above, the Crowther et al. reference may produce steels having high yield strength, and Crowther et al. also refers to other properties such as toughness and ductility (Abstract). There is, however, no mention of formability anywhere in the Crowther et al. reference. Because the Crowther et al. process is intended to simulate a conventional TSDR process, and because there is no mention of formability anywhere in the Crowther et al. reference, Applicants believe that the product produced by Crowther et al. does not possess high yield strength and high formability. As there is no mention of this characteristic of formability in Crowther and there is no suggestion, teaching, or motivation to arrive at the invention of the instant application, applicant respectfully suggests that a prima facie case of obviousness has not been made.

MPEP section 2143.01 indicates that the prior art must suggest the desirability of the claimed invention. "Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. 'The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art.' Here, it is respectfully suggested that the Examiner has not identified a common understanding or a problem to be solved that would allow one to arrive at the invention as claimed.

Further, in contrast to Crowther et al., the combination of process steps recited by claim 1 is intended to produce a flat rolled steel product possessing high

strength and high formability. The process of claim 1 includes a rough reduction step in a first rolling apparatus (step (d)) followed by a step in which the rough-reduced product is held to permit recrystallization of austenite while being maintained at an elevated temperature which is above the recrystallization stop temperature and above the precipitation temperature of the microalloy (step (e)). This is neither taught nor suggested by Crowther et al. Following the recrystallization, the rough-reduced product is transferred to a second rolling apparatus (step (f)) in which the product is subjected to a final rolling step (step (g)).

The rough reduction step (step (d)) of claim 1 is conducted at an elevated temperature, wherein the rougher entry and exit temperatures are above the recrystallization stop temperature and above the precipitation temperature of the microalloy. This rough reduction serves to deform the columnar and mixed grains in the as-cast austenite structure, in preparation for the subsequent recrystallization (para. [00022] of the present application). Furthermore, maintaining sufficiently high rougher entry and exit temperatures is also important to the recrystallization (para. [00023] of the present application). There is no teaching, suggestion, or motivation in Crowther for a rough reduction step in which the entry and exit temperatures are above the recrystallization stop temperature and above the precipitation temperature of the microalloy.

The recrystallization step (step (e)) of claim 1 is similarly conducted at an elevated temperature which is above the recrystallization stop temperature and above the precipitation temperature of the microalloy, which may preferably be in the range from 1020°C to about 1150°C (para. [00025] of the present application). The rough-reduced product is held at this temperature for a time sufficient to permit substantially complete recrystallization of the austenite and thereby reduce the austenite grain size.

The performance of the above steps (d) and (e) before the product enters the second rolling apparatus for final thickness reduction ensures that the product entering the second rolling apparatus has increased grain refinement to provide strength, and ensures that there is little or no precipitation of microalloy until after the material passes through the second rolling apparatus (para. [00031] of the present application). Thus, the material being rolled is relatively "soft", resulting in a reduction in power required to roll the material and a corresponding improvement in dimensional control. In addition, Applicants have found that the process of claim 1 produces products with higher formability than those produced by conventional TSDR processes, and that the formability is surprisingly independent of the final thickness to which the product is rolled (para. [00032] of the present application).

The Crowther et al. process differs significantly from the instant invention defined by claim 1. The Crowther et al. process lacks steps corresponding to steps (d) and (e) of claim 1 of the instant invention. In Crowther et al., there is no refinement of the austenite grains prior to rolling, rather the coarse microstructure of the as-cast ingots (Page 638, para. 3.1.1 of Crowther et al.) is preserved until after the equalization step (Page 638, para. 3.1.2 of Crowther et al.), immediately following which the ingots are rolled. Therefore, Crowther et al. does not provide grain refinement prior to final rolling, and therefore does not provide any teaching, motivation, or suggestion for a process step corresponding to step (d) of claim 1.

Crowther teaches that recrystallization of austenite occurs during the first four rolling passes (Page 639, para. 3.1.3 of Crowther et al.), after which the product is held for a period of approximately 25-40 seconds and allowed to cool to 870°C. After this step, the product is subjected to a fifth rolling pass. This is to be contrasted with the process of claim 1, in particular step (e), in which the rough-reduced product is held at a temperature above the recrystallization stop temperature and above the precipitation temperature of the microalloy, as it is during steps (b) and (d), for a time sufficient to permit substantially complete

recrystallization of the austenite. There is no teaching, motivation, or suggestion of such a step in the Crowther et al. paper.

It must be remembered that a person of ordinary skill in the art is a person that would not innovate. A person of ordinary skill in the art is one who thinks along the line of conventional wisdom and does not take to innovate. *Standard Oil Co. v. American Cyanamid Co.*, 774 F.2d 448, 454, 227 USPQ 293 (Fed. Cir. 1985). The invention of the instant application has significant steps that are not found in the Crowther reference. Further, an important teaching of the instant invention is formability which is not found in the Crowther reference. The Examiner has not provided any teaching, suggestion, or motivation that would allow one of ordinary skill in the art to arrive at the invention as claimed.

In view of the above comments, it is clear that there are significant distinctions between the process of claim 1 and that described in the Crowther et al. reference. The process of claim 1 produces a flat rolled steel product possessing both high yield strength and high formability, whereas Crowther et al. produces a product which may have high yield strength, but which likely has the same formability of products produced by conventional TSDR processes. There is no teaching, motivation, or suggestion in Crowther et al. or in any of the prior art of record that a process as claimed in claim 1 would provide these benefits, and therefore the process of claim 1 produces results which are new and unexpected, and which are not obvious in light of the prior art. For at least the reasons set out above, independent claim 1 and dependent claims 2 to 18 are allowable over Crowther et al. and the other prior art of record.

Reconsideration of Claims 1- 18 is respectfully requested. The undersigned invites a telephone call from the Examiner if it would expedite the processing and examination of the application.

If there are any additional charges, or any overpayment, in connection with the filing of the amendment, the Commissioner is hereby authorized to charge any such deficiency, or credit any such overpayment, to Deposit Account No. 23-3060.

Respectfully submitted,

Woodling, Krost and Rust

Kenneth L. Mitchell

Kenneth L. Mitchell
Patent Attorney, Reg. No. 36,873
Registered Professional Engineer
Woodling, Krost and Rust
9213 Chillicothe Road
Kirtland, Ohio 44094
phone nos. 440-256-4150;
fax nos. 440-256-7453;
cell no. 440-487-2694
clevepat@sbcglobal.net